

## Web tension measuring amplifier CV 2201

EN

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# 1. Safety instructions

## 1.1 Description

Keep this description in a safe place and accessible for the personnel at all times.

The description is part of the items supplied and is to be read carefully prior to starting assembly, operation or maintenance.

The documentation for an E+L system essentially comprises the higher level system description (A), the individual descriptions of the components (B, C, ... W), spare part lists (X) and the circuit diagrams (Z).

Proceed in accordance with the instructions in the system description. All important processes are described in the system description.

Where necessary, reference is made to the descriptions of the individual components.

## 1.2 Intended use

The measuring amplifier is only allowed to be used to amplify E+L load cell signals.

The measuring amplifier is only allowed to be installed in the customer's machine as defined by E+L.

The measuring amplifier is not allowed to be modified.

The measuring amplifier is built to the state-of-the-art.

Nevertheless, during operation

- Hazards for the user's health or
- Damage to property may occur.

Only use the measuring amplifier

- if in correct working order,
- paying due attention to safety and hazards while observing the locally applicable, statutory and customary safety regulations as well as the regulations for the prevention of accidents.

## 1.3 User groups

All the activities in this description are only allowed to be undertaken by the user groups listed in the following with the stated qualifications.

Activities	User groups	Qualification
Transport/assembly, commissioning, troubleshooting/repair, maintenance, disassembly	Specialist personnel	Technicians, industrial mechanics, fitters etc.
Installation, disassembly	Specialist personnel	Electrical connection only by electricians
Operation	Specialist personnel, unskilled personnel, trainees	Instruction by the operating organization

## 1.4 Explanation of symbols

### **DANGER!**

Signifies that death or serious injury will occur immediately if the related safety measure is not taken.

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### **WARNING!**

Signifies that death or serious injury may occur if the related safety measure is not taken.

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### **CAUTION!**

Signifies that minor injury may occur if the related safety measure is not taken.

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### **NOTICE**

Signifies that a malfunction or damage may occur if the related measure is not taken.

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- ▶ Jobs to be performed.

## 2. Function

### 2.1 Purpose

The measuring amplifier is part of the web tension system ELTENS from E+L. It provides the supply voltage for the load cells PD (max. 2 pieces), and amplifies their signals.

A voltage from 0 to max. 20 mV at the inputs of the amplifier is amplified to an output voltage from 0 to 10 V (or 0 to 20 mA or 4 to 2 mA).

## 3. Transport

- ▶ Only transport measuring amplifier in the original packaging.
- ▶ Observe the transport instructions on the original packaging.
- ▶ Dispose of packaging material correctly.
- ▶ Check measuring amplifier for damage.

## 4. Assembly

- ▶ Mount measuring amplifier near the load cells.

## 5. Installation



### **WARNING!**

#### **Electric shock!**

Live parts can cause an electric shock.

- ▶ Never touch live parts.
- 
- ▶ Connect electrical cables as per the circuit diagram, during this task pay attention to the information on cross-section and screening.
  - ▶ Ensure the insulation is not damaged and the cables are properly fixed and protected.

### 5.1 Supply voltage

The supply voltage for the measuring amplifier is 24 V DC.

### 5.2 Load cell

- ▶ Lay signal cable separate from cables carrying interference or high currents (for example motor cables).
- ▶ Connect signal cables directly to the measuring amplifier without intermediate terminals.
- ▶ Ensure the screening on signal cables is only connected to ground at the measuring amplifier.

### **NOTICE**

The connecting cables between the load cells and the measuring amplifier should be kept as short as possible.

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### 5.3 Earth and ground connections

### **NOTICE**

All E+L components must be at the same ground potential as the entire machine.

Cables **not** procured from E+L must be the same as the E+L cables, that is they must also be screened so that **all** connections can be made as shown in the wiring diagrams.

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- ▶ Make earth and ground connections as shown in the wiring diagrams. See also EMC leaflet.

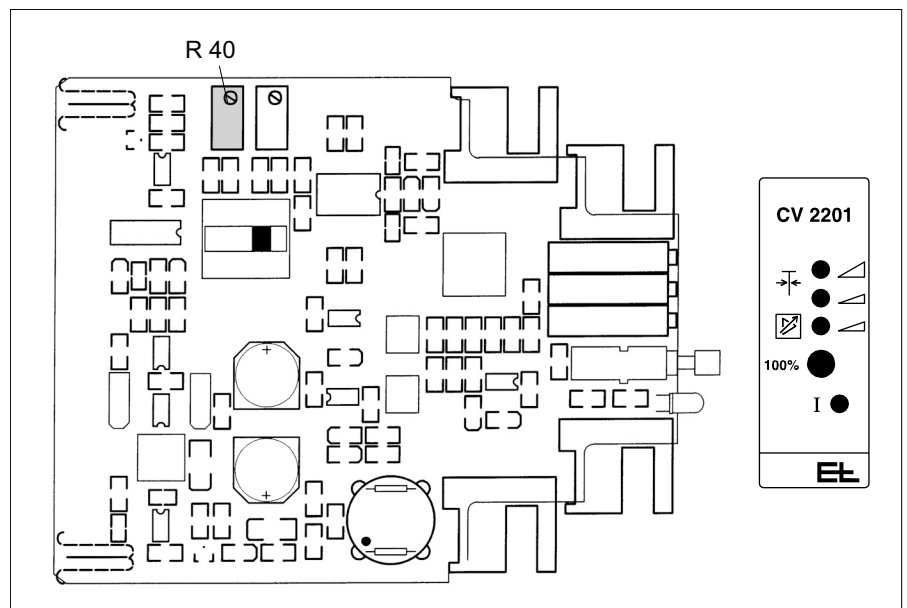
## 6. Commissioning

### 6.1 Measuring roller

#### NOTICE

The measuring rollers must be mounted free of mechanical stress and move freely.

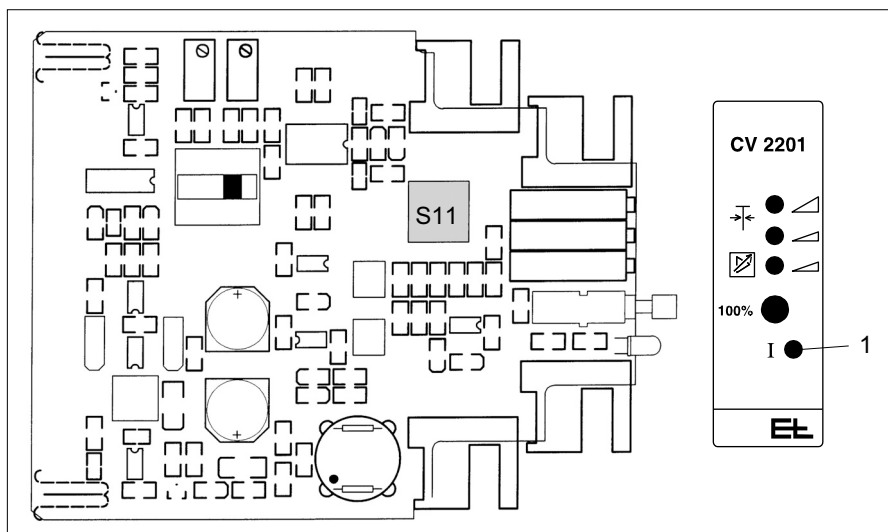
### 6.2 Safety barriers



#### NOTICE

In conjunction with safety barriers, the bridge voltage  $U_B$  must be adjusted from 10 V DC to the maximum using the potentiometer R40 (right stop).

### 6.3 Web tension measuring amplifier

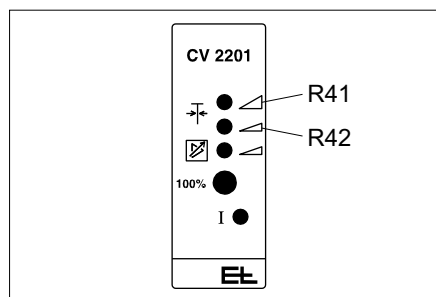


- ▶ Switch on supply voltage and check whether the LED (1) on the measuring amplifier illuminates.
- ▶ Connect digital voltmeter (measuring range 15 V DC) to the terminals for the output voltage  $U_{\text{Direct}}$ . See wiring diagram or chapter Connection.
- ▶ Set switch S11 for the gain range to position 2.

#### 6.3.1 Tare calibration

##### NOTICE

The measuring roller must be without load.



External interfering factors that could affect the measured result, such as the roller weight, are compensated using tare adjustment (zero calibration).

- ▶ Adjust output voltage  $U_{\text{Direct}}$  as accurately as possible to 0.0 V or less than 0.05 V with the aid of the potentiometer for coarse (R 41) and fine adjustment (R42).

#### 6.3.2 Calibration

##### NOTICE

The amplifier can be calibrated with or without a test weight.

**We recommend undertaking calibration with a test weight, as this method is considerably more accurate.**

**In conjunction with safety barriers or load cells of types PD 15.. and PD 25.., calibration without a test weight is not possible.**

The resultant web tension in the measuring direction should not significantly exceed the nominal measuring force so that, in case of asymmetrical web tension distribution, the individual load cells continue to operate in the linear range.

### 6.3.2.1 Calibrating with test weight

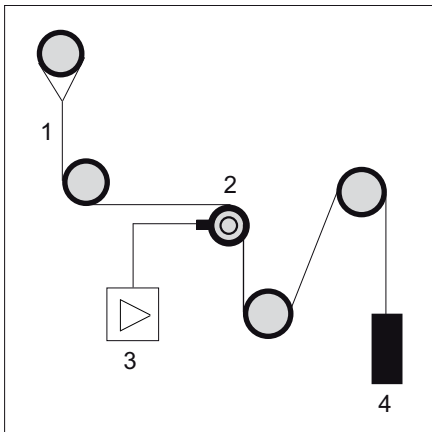


Fig. 6-1:  
 1. Belt  
 2. Measuring roller  
 3. Amplifier  
 4. Test weight

- ▶ Determine maximum web tension. This aspect was defined during planning. If this is not the case, determine web tension empirically.
- ▶ Place a belt over the middle of the measuring roller in the same way as the web will be positioned subsequently (see figure).
- ▶ Hang the test weight on this belt; the weight should correspond to the web tension, as far as possible.
- ▶ Measure signal voltage  $U_E$  from the load cell at the amplifier's input.

If the signal voltage is higher than the maximum range stated in the technical data for the load cell, the load cell is overloaded.

- Change wrapping angle or measuring direction.
- If necessary, use heavier duty load cell.

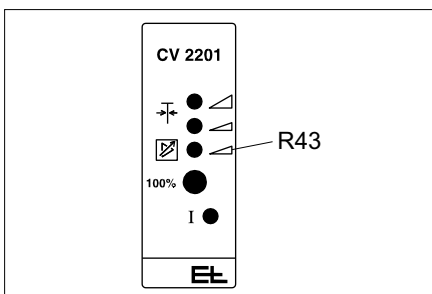
- ▶ Measure output voltage  $U_{Direct}$ .
- ▶ Adjust amplifier using the potentiometer R43. Turning clockwise will increase the amplification factor.
  - In the case of a test weight that corresponds to the maximum web tension, the signal voltage from the load cell must be amplified to an output voltage  $U_{Direct}$  of 10 V.
  - In case of a smaller test weight, the output voltage must be set correspondingly lower.

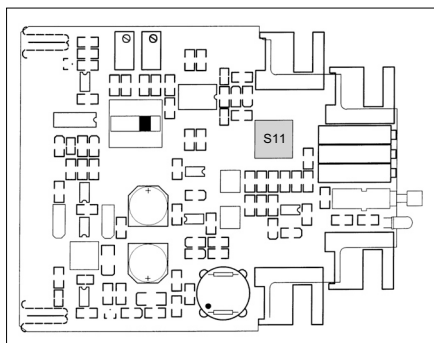
**Example:**

If the maximum web tension to be measured is 1000 N and there is a test weight of 750 N hanging over the measuring roller, the output voltage  $U_{Direct}$  must be 7.5 V.

Stated as a formula:

$$U_{Direct} = \frac{\text{Force due to test weight (N)}}{\text{Maximum web tension (N)}} \times 10 \text{ Volt (V)}$$





**NOTICE**

If the required output voltage is not achieved, the gain range must be changed using switch S11.

If the output voltage is too low, set gain range 0, if the output voltage is too high, set gain range 1 or 3.

If the required output voltage can still not be achieved, contact E+L Service.

- ▶ Once the output voltage is set, remove calibration weight and belt. **The commissioning of the measuring amplifier is then complete.**

**6.3.2.2 Calibrating without test weight**

**NOTICE**

In case of calibration without a test weight, a reference voltage is applied to the amplifier's input instead of the signal from the load cell.

- ▶ Determine maximum web tension. This aspect was defined during planning. If this is not the case, determine web tension empirically.
- ▶ Then calculate the following data:
  - Resultant web tension in measuring direction ( $F_R$ ) at maximum web tension
  - Output voltage  $U_{Direct}$

$$F_1 = F \times \cos \alpha$$

$$F_2 = F \times \cos \beta$$

$$F_R = F_1 + F_2$$

$$U_{Direct} = \frac{F_N}{F_R} \times 10 \text{ V} \times \frac{1 \text{ (mV/V)}}{K \text{ (mV/V)}}$$

$$V = \frac{F_N}{F_R} \times 1000 \times \frac{1 \text{ (mV/V)}}{K \text{ (mV/V)}}$$

$F =$  Web tension  
 $F_1, F_2 =$  Web tension component  $F$  in measuring direction (N)  
 $F_R =$  Resultant web tension in measuring direction (N)  
 $F_N =$  Nominal load cell measuring force (N)

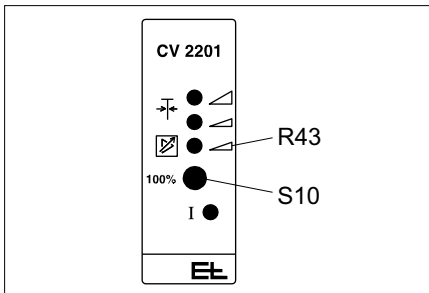
**Note:** In case of measurement on both sides (1 load cell on the right and one load cell on the left of the measuring roller) the nominal measuring force  $F_N$  is to be doubled.

$U_{Direct} =$  Output voltage (V)  
 $V =$  Output voltage (V)  
 $K =$  Amplification factor  
 Nominal characteristic (**sensitivity**) of the load cell (e.g. 1 mV/V or 2 mV/V, see technical data for the load cell)

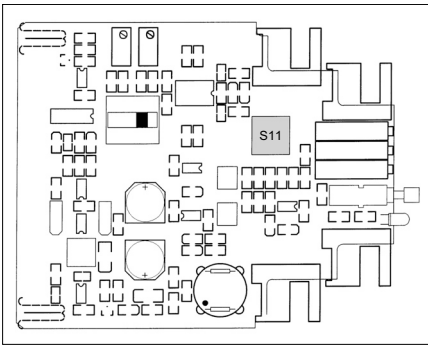


**NOTICE**

Calibration without a test weight is only possible if the output voltage  $U_{\text{Direct}}$  calculated is  $< 12.5 \text{ V}$ .



- ▶ Press button S10 and keep pressed. Button S10 simulates a nominal characteristic of  $1 \text{ mV/V}$ .
- ▶ Measure output voltage  $U_{\text{Direct}}$ .
- ▶ Adjust gain using potentiometer R43 until the output voltage  $U_{\text{Direct}}$  calculated is displayed. Turning clockwise will increase the amplification factor.
- ▶ Release button S10.

**NOTICE**

If the required output voltage is not achieved, the gain range must be changed using switch S11.

If the output voltage is too low, set gain range 0, if the output voltage is too high, set gain range 1 or 3.

If the required output voltage can still not be achieved, contact E+L Service.

**The commissioning of the measuring amplifier is then complete.**

## 7. Troubleshooting / repair

If a fault should occur in the measuring amplifier, it is necessary to replace the device and send it to the factory. No parts can be replaced on-site.

- ▶ For information on disassembly of the measuring amplifier, see chapter "Disassembly".

## 8. Disassembly



### WARNING!

#### Risk of injury!

Disassembly is only allowed to be undertaken with the machine switched off.

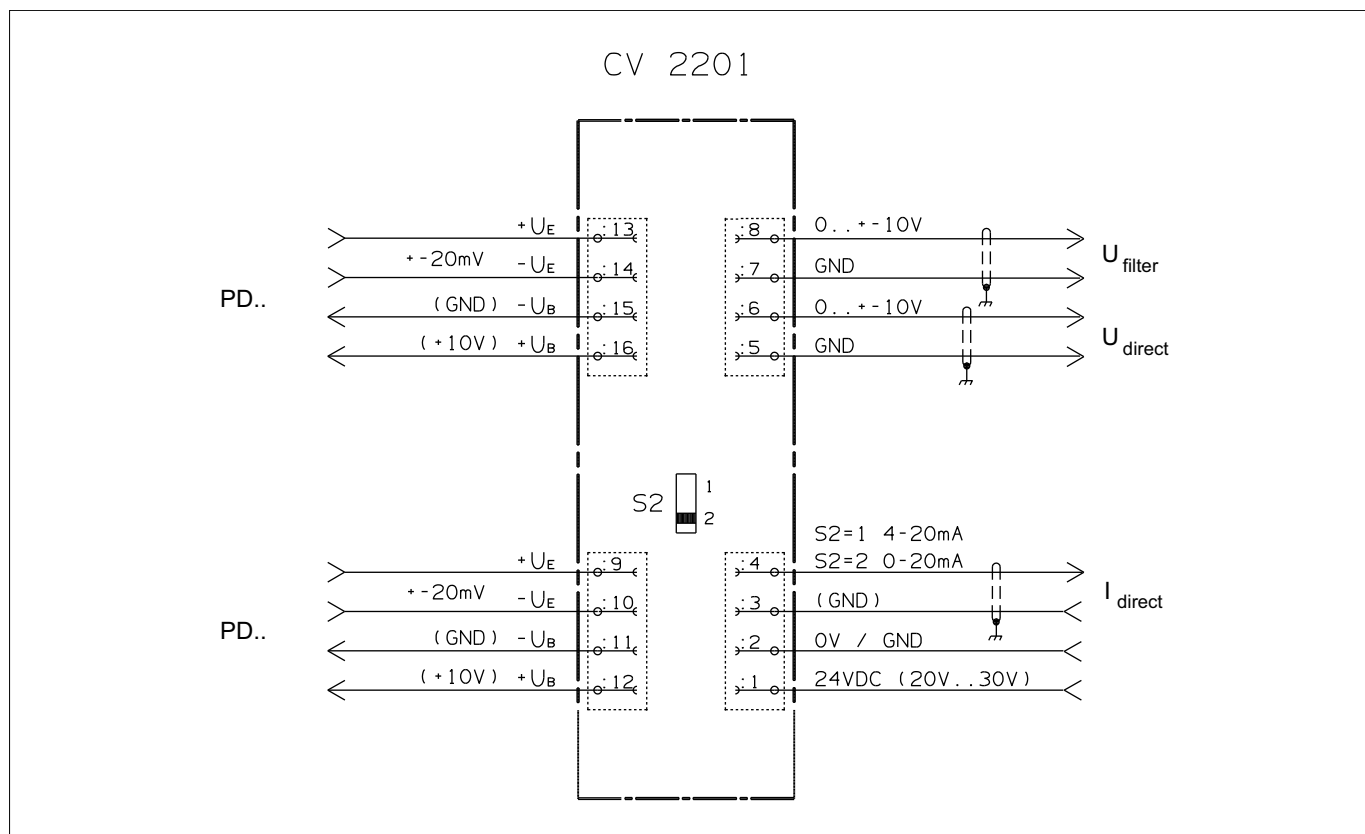
- ▶ Switch off machine.
  - ▶ Secure machine against switching back on.
- 
- ▶ Disassemble in the reverse order of assembly as described in chapter "Assembly".

During this process follow all instructions given in the chapters "Assembly" and "Installation".

## 9. Wiring Diagram

### NOTICE

For the exact connection assignment for the installation of the inputs and outputs, refer to the wiring diagram.



## 9.1 Outputs

The web tension is available in three different signals:

- Filter output  $U_{\text{Filter}}$  (0 to  $\pm 10$  V/10 mA, rise time 2 s) for instruments.
- Direct output  $U_{\text{Direct}}$  (0 to  $\pm 10$  V/10 mA, rise time 5 ms) for fast measured value acquisition and for downstream control circuits.
- Current output  $I_{\text{Direct}}$  (0 to 20 mA or 4 to 20 mA, rise time 5 ms) for measured value transmission over longer distances.  
Sliding switch in position 1: 4 to 20 mA  
Sliding switch in position 2: 0 to 20 mA (works setting)

### **NOTICE**

Make sure that the load (current sensing resistor) does not exceed a value of 600 Ohm!

The current output is only active with a positive voltage on the amplifier's input.

Should the load cell output a negative signal voltage, the connections for the bridge supply voltage  $+U_B$  and  $-U_B$  are to be swapped.

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## 10. Technical data

Accuracy class	0.1
Amplification range	0: 990 - 3400
Switch S11	1: 400 - 1250 2: 600 - 2050 3: 300 - 1025
Input voltage $U_E$	0 to $\pm 20$ mV
Output	
- Voltage	0 to $\pm 10$ V (rise time 5 ms)
- Filtered voltage	0 to $\pm 10$ V (rise time 2 s)
- Current	0 to 20 mA or 4 to 20 mA (rise time 5 ms)
Nominal temperature range	0 °C to +60 °C
Temperature coefficient	
Characteristic value	0.3 %/10 K
Zero signal	0.3 %/10 K
Bridge supply voltage	0.04 %/10 K
Operating voltage	
Nominal value	24 V DC
Nominal range	20 to 30 V DC (ripple included)
Current consumption	0.2 A
Bridge supply voltage	
Nominal value	10 V DC
Nominal range	9 to 13 V DC
Protection class	
Rail mounting in acc. with DIN EN 50022	IP 00
Dimensions	See dimension drawing

**Subject to technical change without notice**